THURSDAY, APRIL 7, 1887

A NATURALIST IN SOUTH AMERICA

Notes of a Naturalist in South America. By John Ball, F.R.S., M.R.I.A., &c. (London: Kegan Paul, Trench, and Co., 1887.)

I.

BY this unpretending little volume its author has opened up to view a new avenue to knowledge—a royal road, in short, to anyone as competent as he has shown himself to be to take advantage of all that it offers to an intelligent traveller with his eyes and ears open. Its contents are a rich collection of facts and thoughts, chiefly botanical, meteorological, and geographical, acquired during a five months' voyage over 18,400 miles of ocean, and embracing 100° of latitude, during which the author passed only seventy days on dry land; and they are laid before the reader in a style which is as attractive as instructive.

In the preface Mr. Ball says of his voyage:—"A tour round the South American continent, which was completed in so short a time as five months, may not appear to deserve any special record; yet I am led to hope that this little book may induce others to visit a region so abounding in sources of enjoyment and interest. There is no part of the world where a traveller can view so many varied and impressive aspects of Nature, whilst he whose attention is mainly given to the progress and development of the social condition of mankind will find in the condition of the numerous States of the continent, and the manners and habits of the many different races that inhabit it, abundant material to engage his attention and excite his interest." Mr. Ball adds that, though the aim of his journey was mainly to see Nature in aspects new to him, he, as an unprejudiced visitor, gives also his impressions as to the social and political condition of the different regions which he visited. With these impressions we need not concern ourselves, though we may say that they seem to us to be both just and liberal.

Leaving England in March 1882 as a passenger on board a West Indian mail-steamer, Mr. Ball found that the passage across the Atlantic offered nothing of unusual interest, but even this well-beaten track suggests some good ideas as to rate of flow of the upper and lower strata of the aërial currents forming the trade-winds. Barbados was made in thirteen days, where, amongst other vegetable treasures, he obtained the fruits of the sandbox-tree (*Hura crepitans*), the explosive nature of which is well known, though not the violence of its character, which would suggest an alternative name of the dynamite-tree. Mr. Ball carried away a specimen packed in a wooden box, which he subsequently placed in his herbarium room in London, where, nine months after it had been obtained, it burst with such violence that the box was broken to pieces, and the valves and seeds of the fruit were scattered all about the room.

A single day at Jamaica afforded him his first glimpse of a thoroughly tropical vegetation *in situ*, and it would be difficult to find a terser or better description of its appearance to a Londoner than his simple statement that "it seemed to me as if the inmates of the Palm House at Kew had broken loose and run scrambling up the rocky hills."

The Isthmus of Panama crossed and the Pacific reached, the real interest of the voyage begins. The first impression Mr. Ball gains—suggested by the breadth of the Bay of Panama (120 sea[1] miles across)—is of the vastness of the geographical features of America as compared with the ideas formed of them from experience of "our diminutive European continent," and from maps, and especially from those on Mercator's projection. In respect of this last he not inaptly complains that it profits nothing to explain, even to the most intelligent youth, the nature and amount of the errors involved in that mode of representing a spherical surface on a plane; and he goes on to say: "I verily believe that all the mischief done by the stupidity, ignorance, and perversity of the writers of bad school-books, is trifling compared to the amount of false ideas spread through the world by the production of that respectable Fleming."

A few hours botanising in the coast forests of Buenaventura, a port on the coast of Columbia, yielded a harvest of plants which forged the first link in a chain of reasoning that has led Mr. Ball to the conclusion (opposed to the view of all other writers on the same subject) that the most marked division of the flora of tropical South America is not that between the regions east and west of the Andes; for on his arrival in Brazil he found that, though he was nearly 3000 miles from Buenaventura, and separated from it by the great barrier of the Andes, the plants of the forests of that country were almost all nearly allied to Brazilian forms. This is followed by a bold speculation, dwelt on at greater length towards the conclusion of the work, that "the ancestors of the Brazilian flora, and to a large extent also those of the Andean flora, came into existence in the ancient high mountain ranges of Brazil, where we now see, in the vast extent of arenaceous rocks, and in the surviving pinnacles of granite, the ruins of one of the greatest mountain regions of the earth."

Crossing the equator, our naturalist was disappointed in not seeing Chimborazo, still in popular estimation the "hub" of the South American continent, though geographers have long known that it has to bow its head to Aconcagua, upwards of 2500 miles further south. Chimborazo is only seventy miles from Guayaquil, whence it is easily seen on clear days, but we are told these occur only about half a dozen times in the year!

Cape Blanco, the westernmost cape of South America, rounded, the so-called rainless zone of South America, which extends for nearly 2000 miles to the southward, is reached. This is a feature of the highest interest to the biologist and meteorologist. Its access was signalled by the sudden fall of temperature from an average of 80°, with a relaxing atmosphere "heavily charged with vapour,"[2] to 74°, with an elasticity in the air that dispelled a previous lassitude, which had rendered burdensome even the first taste of the charms of tropical scenery.

In no part of the world is a change in vegetation more suddenly effected than in the short distance, amounting to little over 100 miles, between the Gulf of Guayaquil and

---

[1] Surely an oversight for English miles.

[2] When shall we have accurate conceptions embodied in our colloquial phraseology? The vapour of water is lighter than atmospheric air, yet the latter is conventionally described as "heavily laden" with it.

Payta. Nowhere in the world are the forests more luxuriant than in the former place, whereas, on arriving at Payta, Mr. Ball was informed by the officers of the ship that it was no use his taking his botanical box ashore with him, because the country was absolutely without vegetation. As, however, the forewarned expected, this was not quite the case: stunted bushes grew in the cliffs, nor were plants absent on the plateau above, where, however, the vegetation was more scarce than he had anywhere seen it, except in the tract west of the Nile above Cairo. He remarks that the gullies furrowing the seaward face of the plateau show that heavy rains must visit this part of the coast, and on inquiry he was informed that abundant rain, lasting for several days, recurs at intervals of three or four years. This, he subsequently found, is a normal feature of the rainless zone, added to which he was informed that slight showers occur at intervals a few times in the year, which suffice to maintain the vitality of the few species of plants that hold the ground persistently; whilst the heavier rains are followed by an outburst of herbaceous vegetation covering the surfaces that have long been bare.

For the existence of this rainless zone Mr. Ball considers that the hitherto assigned causes are insufficient. These are: the influence of the Andes in condensing the Atlantic vapours brought by the westward atmospheric flow; the warming in its passage north of the vapour-bearing aërial currents that accompany the Antarctic or Humboldt oceanic current; and the effect of this warming of the air in enabling it to hold in suspense all the vapour it absorbs in its passage north Mr. Ball's principal objections to the sufficiency of these causes are that the Andes of Ecuador and Columbia do not condense the western vapour-bringing winds, whilst those of Peru, Bolivia, and North Chili do; and that the littoral zone of the former regions is, for a distance of 800 miles, even moister than parts of the coast of Brazil and Guiana. His supplemental explanation is based chiefly on the physical features of the Andes. In Peru the Andes present four parallel longitudinal chains, increasing in mean elevation in going westward, though the highest peaks are not on the westernmost range. In Ecuador only two such ranges, the two westernmost, exist, and these do not suffice to drain the vapour-bringing winds, a portion of whose moisture is precipitated on the Pacific coast. In Columbia, again, there are three of these parallel ranges, enough perhaps to drain the easterly winds; and its sources of moisture may be supposed to be derived from the diversion southwards of easterly currents from the Caribbean Sea which have crossed the Isthmus of Panama. On the whole, however, Mr. Ball considers that the influence of the Humboldt currents, oceanic and aërial, is of far greater moment than is that of the Andes, since the influence of these currents is felt even to the north of the Gulf of Guayaquil, as at Cape St. Elena, where the rains are less frequent than at Guayaquil. For the further description of this interesting subject we must refer to the work itself.

On April 15, Callao, the port of Lima, was reached, and a ten days' expedition to the higher Andes was effected. For this there were two railroad facilities. One line starts from the coast at Mollendo, south of Callao, and, running by Arequipa, crosses the crest of the Andes, and terminates at Lake Titicaca, 12,800 feet above the sea. The other starts from Lima itself. It was projected with the intention of piercing the crest of the Cordilleras at an elevation of 15,645 feet above the sea, thence descending to Oroya, a plateau between the main ranges. Its ultimate object was to afford a route to the fertile districts on the eastern slopes of the Andes. As yet it has only reached a village called Chicla, 12,200 feet above the sea, its progress having been stopped by the war between Peru and Chili. The first of these routes was obviously the most desirable for a naturalist, but want of time and the fact of Arequipa being in possession of a Peruvian force drove Mr. Ball to take the Chicla route. To the professed naturalist Mr. Ball's observations on this little expedition offer much of interest, but the season was unfavourable for botanising, the weather at the culminating point wretched, and the natural features of the country, under such conditions at any rate, anything but inviting. There is a brief discussion on mountain sickness, of which Mr. Ball has already detailed his symptoms in this journal (vol. xxvi. p. 477). They are anomalous; but as his elevation was only 12,200 feet, at which many mountaineers who suffer acutely at 16,000 feet and above it feel no inconvenience at all, his experience is insufficient. That the symptoms should disappear during bodily exercise is opposed to what is described in the cases not of man only, but of cattle, sheep, and horses, in crossing high passes. The observations on the temperature of the upper Andean regions as compared with that of the coast are very valuable, as are the notes on the zones of vegetation, the ranges of species, the distribution of endemic forms, &c.

On his return to Lima, Mr. Ball obtained some further information regarding the well-known hollowed cliffs of volcanic rock which occur along the coast, and reach to 700 feet above it, and which have been written of by Lyell and others as indications of a rise of the land. According to a very intelligent local observer, Mr. William Nation, of Lima, the excavations are due chiefly to a cryptogamic plant which grows on the surface of the cliffs, and is in active vegetation as a disintegrating agent during the dense fogs that prevail for many months of the year. Mr. Nation thinks that alternations of dry and damp air, by causing the cells of this burrowing plant to expand and contract, effect the removal of scales of mineral matter from the surface of the rock, and hence eventually excavate the latter. Fancying that the plants might (as do some lichens) chemically affect the rock, Mr. Ball submitted specimens to an eminent cryptogamist, who found it to be an Alga, and harmless in this respect. Mr. Ball himself is disposed to think that vicissitudes of temperature aided by alternations of moisture and dryness, dry fog and sun, may play the greatest part in effecting the hollows. It is to be hoped that Mr. Nation will follow up the problem, which wants only careful observation to solve it.

Between Callao and Coquimbo, along a monotonous coast, several places were visited, but these seem to be far from being oases; some of them, indeed, are dependent on transport by sea for a supply of fresh water. The track between Arica and Copiapo, a distance of 600 miles, "further than from Liverpool to Oporto," is that in which the rainless zone is most pronounced. With the possible exception of Pisagua, there is no inhabited place where drinkable water is to be had, and yet the wants (or greed) of men have established many industrial settlements along the coast for the purpose of working mines of silver, copper, and lead, and digging deposits of alkaline nitrates. Drinking-water is, in most of these towns, provided by the distillation of sea-water ; in others it is imported. Nine such places were touched at by the steamer ; their features were uniform, and, we may add, uniformly repulsive : chemical works with tall chimneys, sheds of reeds for workmen, a few clean-looking houses for managers, and grog-shops. At one of these, Tocopilla, Mr. Ball observes :—"At last I found, what I had often heard of, but in whose existence I had almost ceased to believe, a land absolutely without a trace of vegetable life. Not only was there no green thing ; not even a speck of lichen that I could detect, though I looked at the rocks through a lens. Even more than by the absence of life I was impressed by the appearance of the surface, which showed no token that water had ever flowed over it. Every edge of rock was sharp, as if freshly broken, and on the steep slope no trace of a channel furrowed its face. The aspect is absolutely that of the scenery of the moon—of a world without water, and without an atmosphere." Curiously enough, small birds, which live on stable manure, were the only trace of indigenous animal life ; what they were Mr. Ball could not approach them near enough to see. Seaweeds, however, though scarce, occurred in pools left by the tide, and relieved the barren coast from the curse of being without vegetation. At Caldera, the port of Copiapo, vegetation begins, and, though the environs are sandy, bushes and inclosed gardens are to be seen, and at Coquimbo green is, in the spring at any rate, a dominant colour. On May 9, Mr. Ball disembarked at Valparaiso, and made that town and Santiago his headquarters for twenty days. During this period he made numberless observations on the scenery, climate, vegetation, and geographical features, many of which though referring to matters that are familiar to every scientific reader, abound in thought and shrewdness, and are exceedingly instructive. Leaving Valparaiso, the voyager entered a totally different region of America, physically and biologically, and into it we shall follow him in a future number.

(*To be continued.*)

COLEOPTERA OF THE BRITISH ISLANDS

The Coleoptera of the British Islands. A Descriptive Account of the Families, Genera, and Species indigenous to Great Britain and Ireland ; with Notes as to Localites, Habitats, &c. By the Rev. W. W. Fowler, M.A. Vol. I. Adephaga—Hydrophilidæ. Pp. xxii. and 269. Two Plates. (London : Lovell Reeve, 1887.)

DURING the last thirty years, seven or eight distinct catalogues of British Coleoptera have been published, and have met with an encouraging sale ; hence there can be no doubt that there exists a considerable number of collectors of British Coleoptera. But no really satisfactory systematic work on this department of the faunæ of our islands exists, and Mr. Fowler has done well in attempting to supply such an one. The earlier works of Curtis and Stephens are, for obvious reasons, of little practical use in the present day, and though, twelve years ago, Mr. H. E. Cox published a hand book of British Coleoptera in two volumes, it cannot be said to have been the work required, owing to the facts that it contained no reference to localities, and that it consisted entirely of systematic tables, without the addition of any matter that could make it a pleasant book to use.

In the work now before us, the author has been very successful as regards these points ; he adopts the system of tables, but gives, in addition, brief diagnostic descriptions of all the species, and satisfactory details of localities and the distribution in our islands. In his prefatory remarks he very properly calls attention to the necessity of access to collections of an elementary nature, so that the student shall have some elementary notions about, at any rate, a few beetles before attempting to use the work. There can be no doubt that he is quite correct as to this point, and it may be hoped that the local museums and school collections that are now becoming numerous throughout the country will be of great use in this respect ; and for this object such institutions should possess a small but well-selected general collection in addition to that of their local fauna.

There are now about 3200 species of Coleoptera on the British list, and the present volume deals with only about one-sixth of these, so that the work when completed will be of considerable extent. The author promises to give, when it is concluded, an introduction to the system of classification employed in it. This is, indeed, indispensable, as at present the student is not supplied with any definitions of the "series" which form the basis of the arrangement used. He already finds, however, under the various subdivisions, remarks on classification and affinities ; these are usually well considered, and will, no doubt, increase greatly the interest of the work, and, it may be hoped, will induce the student to extend his studies to questions of greater interest and importance than the determination of the names of species.

The Coleoptera are an enormous order of insects, comprising already fully 100 000 species, and as their organisation is such that the details of their external structure can be readily observed, much has already been done towards establishing a natural classification of the order. The author has made himself well acquainted with the various recent improvements in this department, and acknowledges in the frankest manner his obligations to authorities in various parts of the world. There are some points of general interest as to the British Coleopterous fauna, such as the number of species peculiar to the islands, but the work before us has not yet sufficiently advanced to enable such points to be discussed with advantage, and we may perhaps find occasion at a future time to consider them.

It would be a very great advantage if zoologists could agree on a system of names for the various aggregates larger than genera. Mr. Fowler's work only gives the individual names of these larger aggregates, and distinguishes them merely by rather slight typographical distinctions ; as a consequence, the student finds himself introduced to a large number of these names in rapid succession, and they must be rather a source of bewilder-